Fuels Workshop on Regulatory and Non-Regulatory Fuels Activities for 2006

October 6, 2006

California Environmental Protection Agency

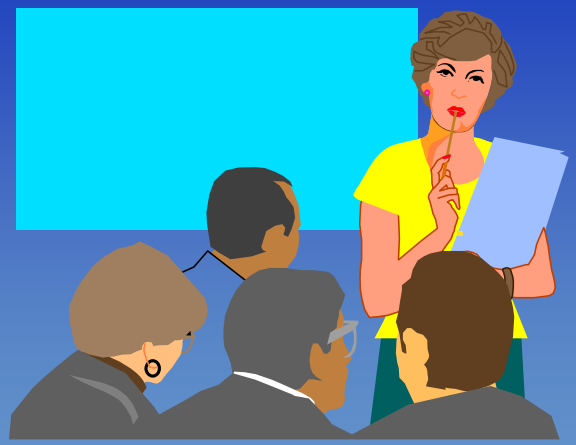
Air Resources Board

Agenda

- Introductions and Schedule
- California Predictive Model
  - Reactivity of Evaporative Emissions
  - 2006 Draft Predictive Model - Statistics
- Presentations by Others
- Open Discussions
- Closing Remarks

Tentative Future 2006 Workshops

- October 27, 2006 from 9:00 a.m. to 12:30 p.m. in the Byron Sher Auditorium
  - This workshop will be webcast. All meetings will be available by conference call.
  - Next set of workshops will be scheduled based on progress



Reactivity of Evaporative Emissions

Reactivity Components of Draft PM

- Additional compounds included (obtained from liquid speciated data) in updated 2006 draft MIR list
  - Will be presented to Reactivity Working Group for comments/suggestions
- Data sets for Diurnal, Hot Soak and Exhaust obtained from in-use testing at El Monte (E6 Fuel)
  - Earlier work done was on whole data set which included some wintertime gasoline blends

Reactivity of Evaporative Emissions (draft)

Diurnal Emissions		
	Average MIR	
Unweighted	2.82	Previous Value = 2.36
Weighted	2.93	
Hotsoak Emissions		
	Average MIR	
Unweighted	3.05	Previous value = 3.12
Weighted	3.03	

Tech 4 = 1986-1995; Tech 5 = 1996-2010

Weightings: Tech 4 = 0.71; Tech 5 = 0.29

2006 Draft Predictive Model

2006 Draft Predictive Model

The 2006 Draft Predictive Model includes several major revisions:

- Draft statistical models for exhaust THC, NOx and CO.
- The 2010 vehicle emission weights from the EMFAC 2007 working draft model, including permeation estimates, using California 8-hour temperature profile and relative humidity.
- Updated Maximum Incremental Reactivity (MIR) values :
  - Based on the 2006 list of MIR of total organic gaseous compounds.
  - Used VEDS data from ARB lab (El Monte)
  - Ethanol permeation reactivity was based on the CRC E-65 study.

Predictive Model Fundamental Eqn

$$\%ChangeinMassEmission = \frac{(Emission_{Cand} - Emission_{\mathrm{Re}\,f})}{Emission_{\mathrm{Re}\,f}} x100\%$$

- This fundamental equation has never changed since the Predictive Model adopted by the Board
- The equation also applies to permeation
- The MIR is used to provide flexibility for refiners to offset exhaust hydrocarbon emissions with evaporative hydrocarbon emissions.

Gasoline

2006 Draft Predictive Model

2010 Statewide, Tech 1-5 (GVW 5,750 lbs)

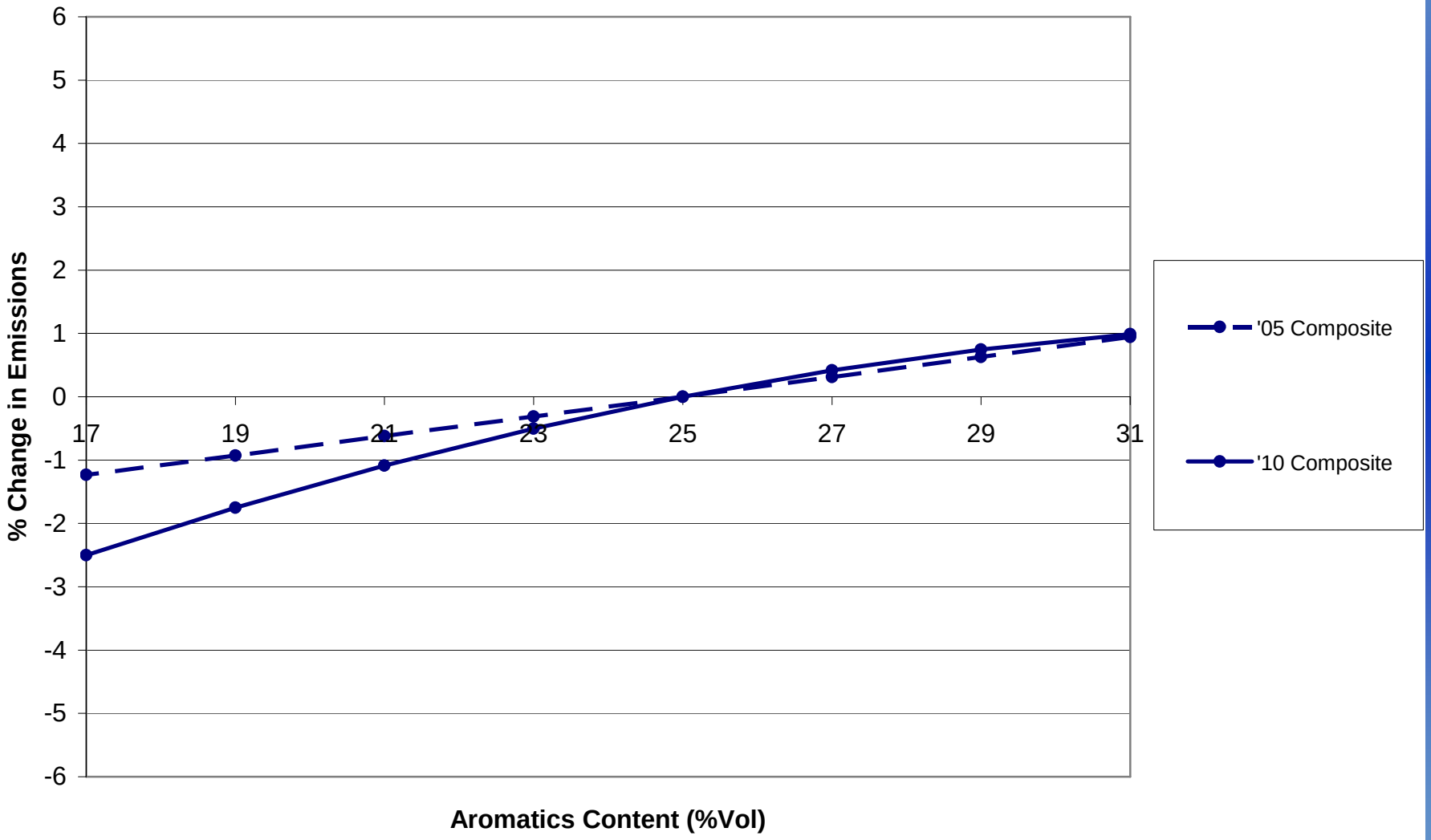
Pollutant	Emission (tpd)	MIR	OFP (tpd)	OFP (%)
Exh TOG	249	3.99	994	43.1
CO	4378	0.06	263	11.4
Evap TOG				
DI/RT	118	2.82	333	14.4
HS	64	3.05	195	8.5
RL	170	2.61	444	19.3
Perm	23	3.27	75	3.3

NOx Response to Fuel Properties

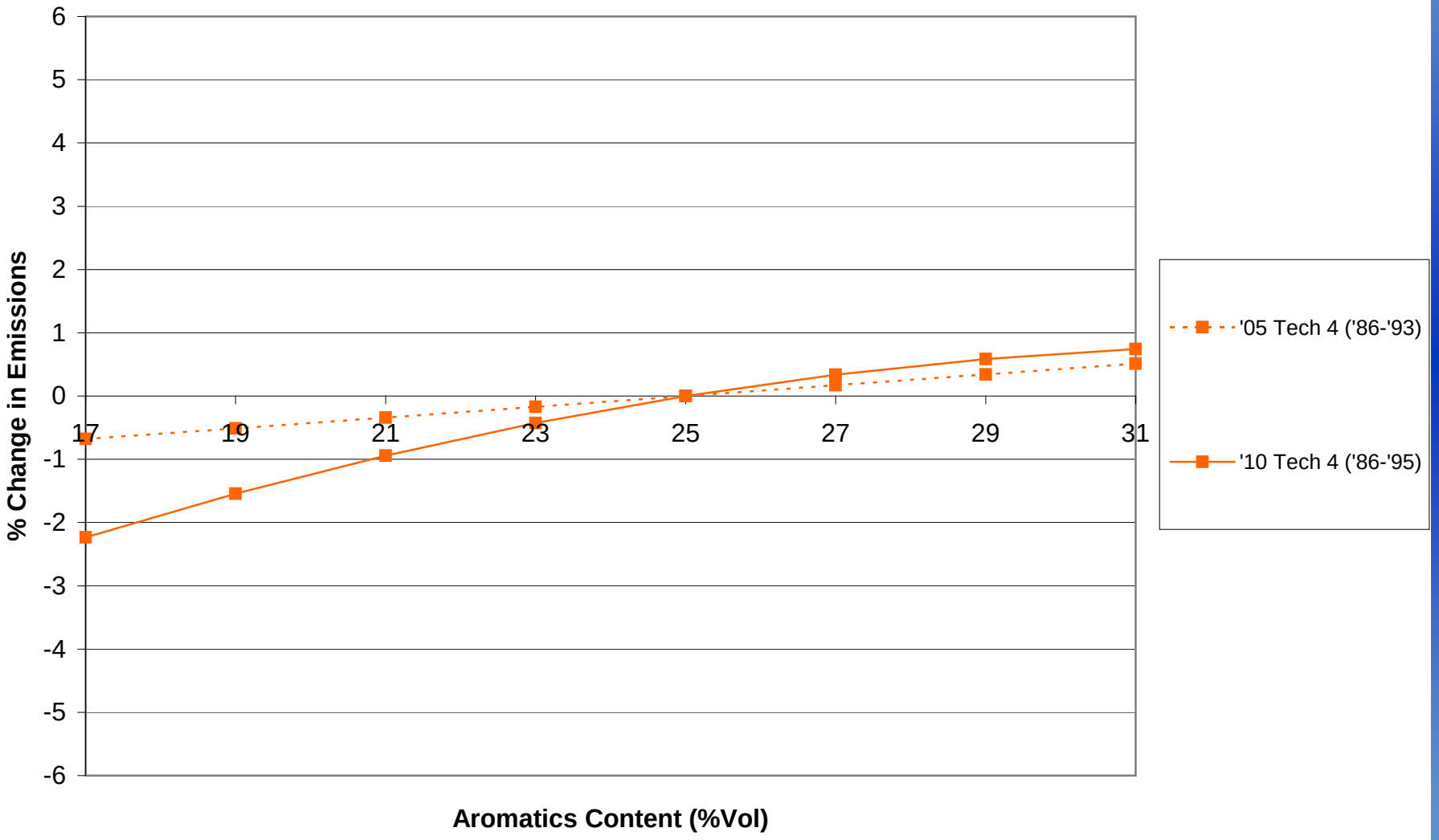
WSPA Concerns with NOx Response:

- # 1 Aromatics: slope gets steeper (Vol < 25%)

Composite NOx Response to Aromatics
(All Other Fuel Properties @ Flat Limits)



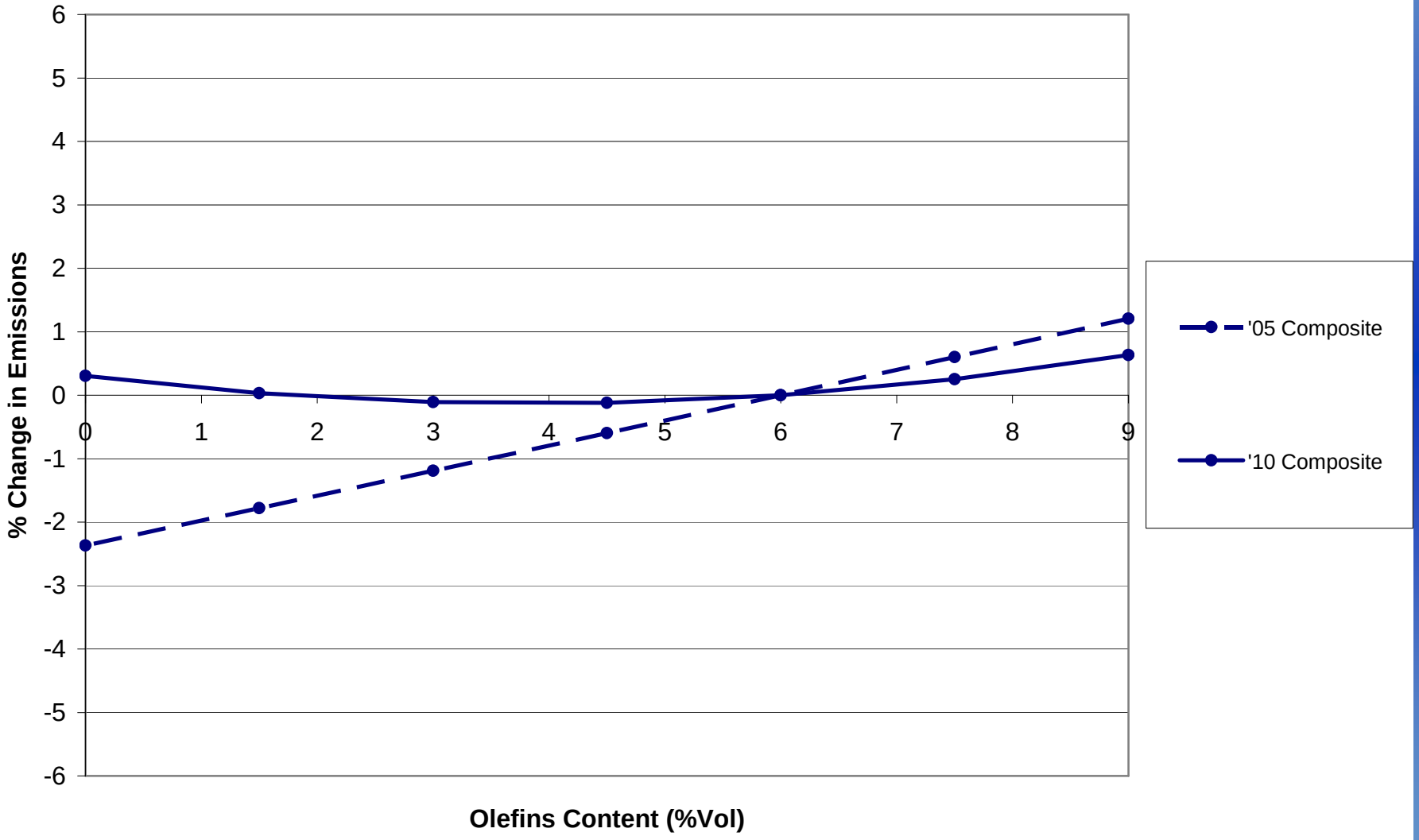
Tech 4 NOx Response to Aromatics
(All Other Fuel Properties @ Flat Limits)



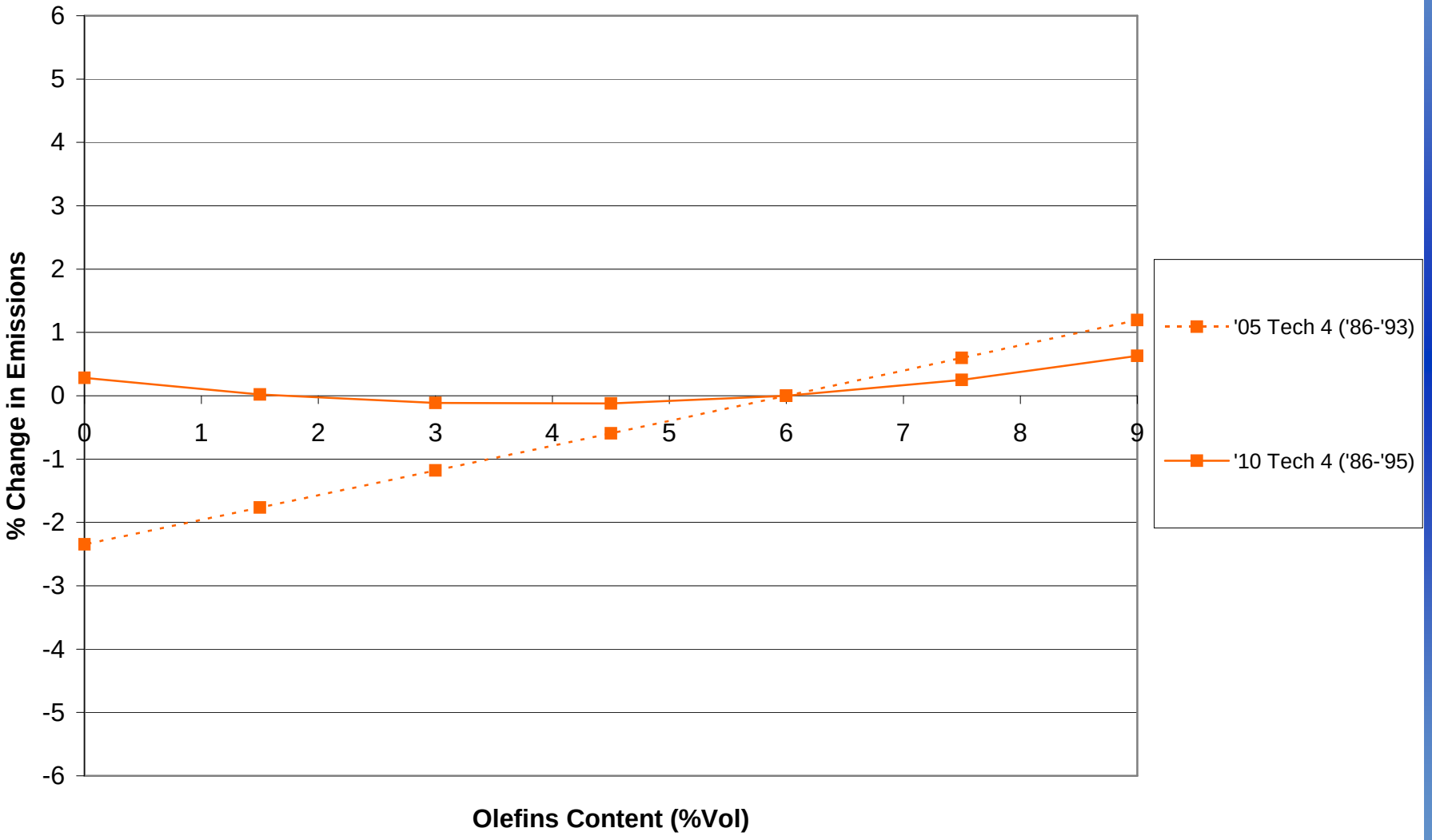
WSPA Concerns with NOx Response:

- # 2 Olefins: Overall response gets flatter

NOx Response to Olefins
(All Other Fuel Properties @ Flat Limits)



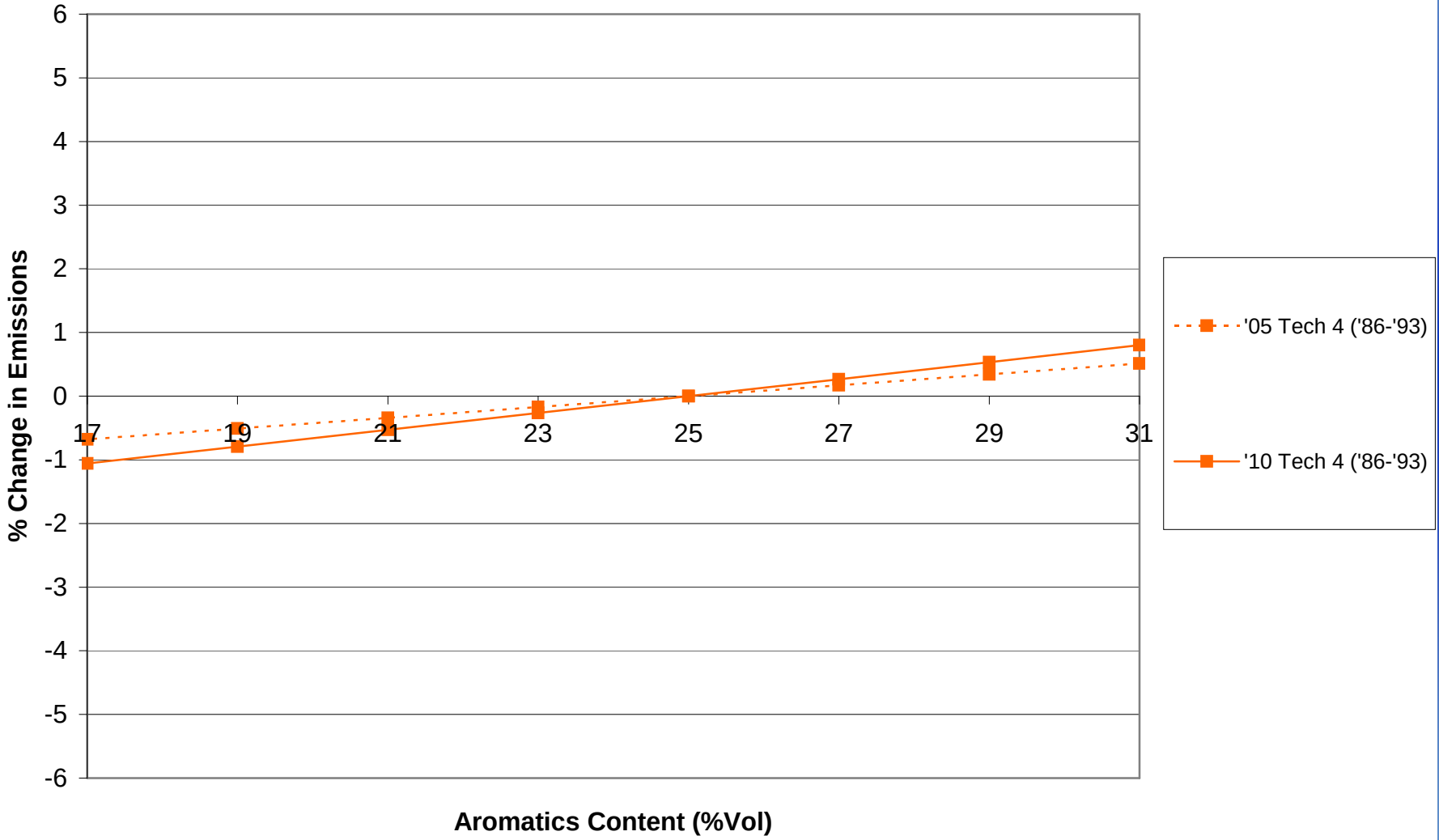
Tech 4 NOx Response to Olefins
(All Other Fuel Properties @ Flat Limits)



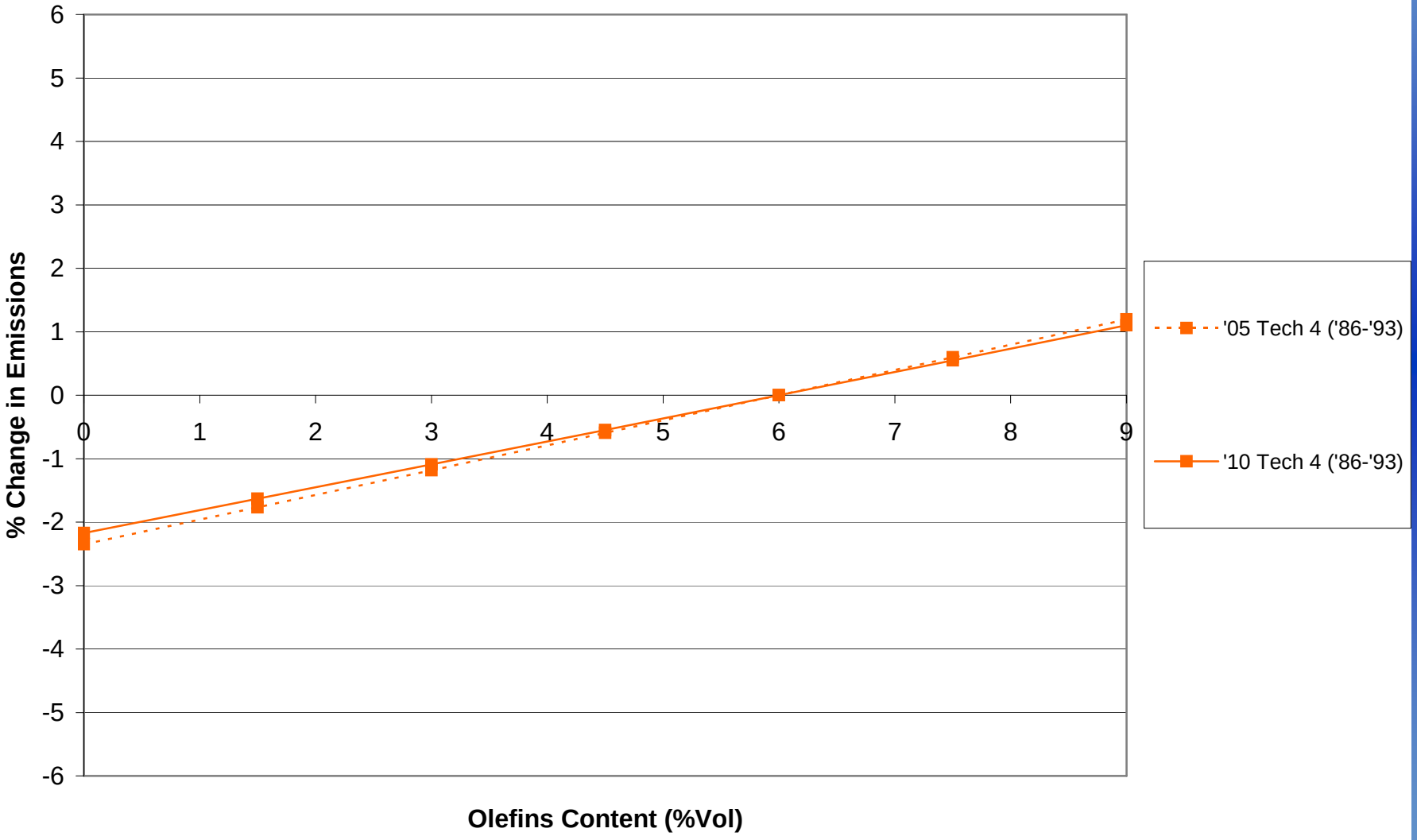
ARB Staff Investigation:

- Compared estimated coefficients for Aromatics and Olefins: Current Model vs. Draft 2006
- Rebuilt Tech 4 from scratch using the condensed data by removing:
  - The added ’94-’95 MY vehicles from Tech 4; and
  - High-influence vehicles; and
  - Squared-terms (ARAR and OLOL)

Tech 4 NOx Response to Aromatics, Removing Squared Terms
(All Other Fuel Properties @ Flat Limits)



Tech 4 NOx Response to Aromatics, Removing Squared Terms
(All Other Fuel Properties @ Flat Limits)



ARB Staff Findings:

- Condensed data are the source of NOx response departure
- Removing the squared-terms resulted in:
  - More parsimonious Tech 4 model
  - A slightly better fit model to the data
  - More comparable to the current Tech
- Next Steps:
  - Rebuild Tech 4-5 NOx using condensed data (removing squared-terms only)
  - Will discuss the results with the Statistical Working Group

Presentations by Others

Open Discussions

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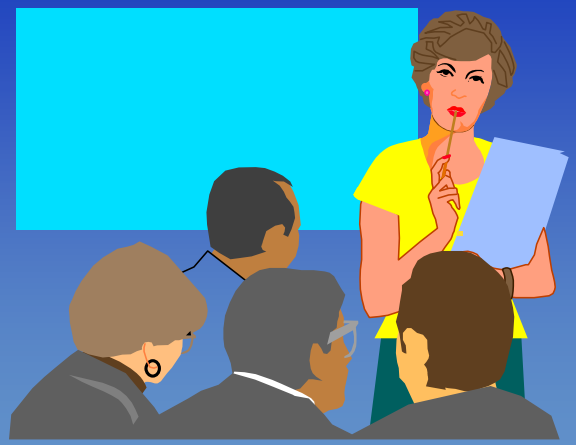
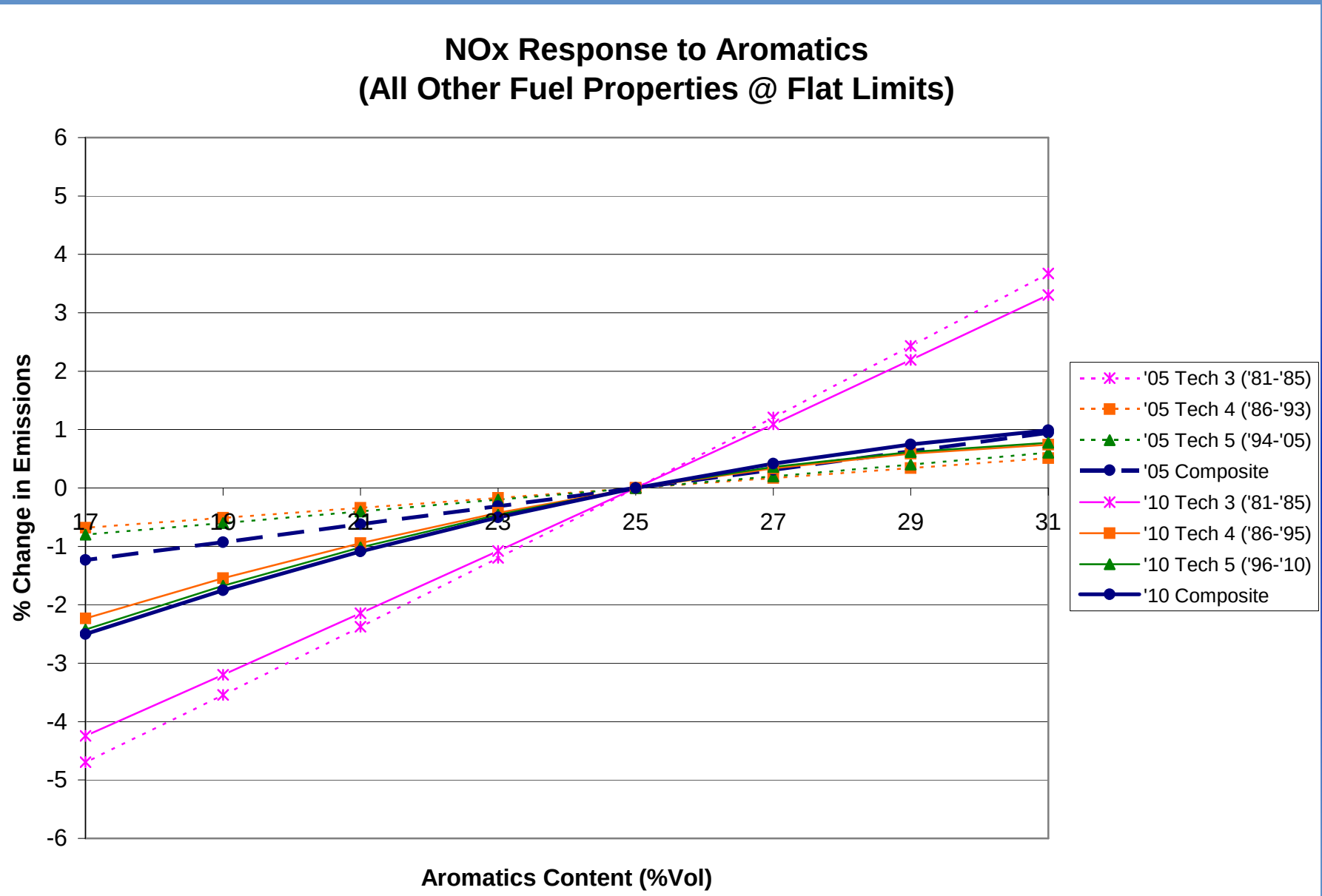


Closing Remarks

Background Slides


NOx Response to Aromatics
(All Other Fuel Properties @ Flat Limits)
% Change in Emissions
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
17
19
21
23
25
27
29
31
Aromatics Content (%Vol)
'05 Tech 3 ('81-'85)
'05 Tech 4 ('86-'93)
'05 Tech 5 ('94-'05)
'05 Composite
'10 Tech 3 ('81-'85)
'10 Tech 4 ('86-'95)
'10 Tech 5 ('96-'10)
'10 Composite

NOx Response to Olefins
(All Other Fuel Properties @ Flat Limits)